REMARKS/ARGUMENTS

Reconsideration is respectfully requested.

Claims 1-13 are pending before this amendment. By the present amendment, claims 1 and 4-13 are amended. No new matter has been added.

In the office action (page 2), the drawings stand objected to because they must show every feature of the invention specified in the claims. In response, the applicants have cancelled the objected feature for the claims, thus rendering the objection moot, and withdrawal of the aforementioned objection is respectfully requested accordingly.

In the office action (page 3), the specification stands objected to because paragraph [0078] describes carrier waves and data transmission through the Internet as a "computer readable recording medium" and a "data storage device". In response, the applicants have amended the specification to delete the language regarding the "carrier waves," thus rendering the objection moot. Accordingly, the applicants respectfully request withdrawal of the aforementioned objection.

In the office action (page 4), claim 13 stands rejected under 35 U.S.C. §101 because the claimed invention is directed to carrier waves, which are considered non-statutory subject matter. As described above, the specification has been amended to delete any reference to "carrier waves," thus rendering the rejection moot. Accordingly, the applicants respectfully request withdrawal of the aforementioned objection.

In the office action (page 4), claims 1-13 stand rejected under 35 U.S.C. §112, ¶2, as being for failing to particularly point out and distinct claim the invention. Specifically, the examiner indicates that it is not entirely clear how objects may remain undeleted even after "the listed objects" are deleted in the first sweep phase. The applicants respectfully submit that since the first sweep phase includes deleting listed objects **during** the calculated residual time, one possible outcome during the sweep phase is that there will not be sufficient time to delete all objects included in the first list. When not all objects are deleted during a first sweep, the undeleted objects

are then deleted during subsequent communication cycles. To better clarify these features of the present invention, claim 1 has been amended to recite, inter alia:

> --performing a mark phase during a communication cycle, the mark phase for making a first list, the first list being an address list including addresses of objects to be deleted from the memory;
> performing a first sweep phase during the communication cycle to delete objects listed in the first list from the memory, wherein the performing of the sweep phase comprises:
> calculating a residual time up to a predetermined time limit after processing an external command;
> after calculating the residual time, deleting objects listed in the first list from the memory during the calculated residual time; and
> updating the first list to include addresses of remaining objects listed in the first list of objects to be deleted which cannot be deleted within the calculated residual time, and storing the updated first list in the memory separately from the objects so as to prevent deletion of the first list.--

Support for the above amendments is found at least in the specification page 9, lines 1-6; thus no new matter has been added. As amended, claim 1 clearly recites forming of a first list including addresses of objects to be deleted, performing a first sweep where objects listed in the first list are deleted, and updating the list after the first sweep to include addresses of objects which remain after the first sweep. The applicants note that the following features:

> --performing a first sweep phase during the communication cycle to delete **objects** listed in the first list from the memory--

> --after calculating the residual time, deleting objects listed in the first list from the memory during the calculated residual time--

and

> --updating the first list to include addresses of remaining objects listed in the first list of objects to be deleted which cannot be deleted within the calculated residual time, and storing the updated first list in the memory separately from the objects so as to prevent deletion of the first list--

clarify that objects listed in he first list are deleted during the calculated residual time. The above language does not require that **all** objects are deleted by the first sweep within the residual time, but rather that objects are deleted within the residual time. Further, since the claim recites "objects" and not "**the** objects" the applicants submit that

it is quite clear give the context of the claim, that "objects" does not require "all objects" to be deleted during the first sweep.

Similar amendments have been made to claims 10 and 13, and for the reasons above, the applicants respectfully request withdrawal of the aforementioned rejections.

In the office action (page 6), claims 1-4, 6, 10 and 13 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,640,529 (Hasbun) in view of U.S. Patent No. 5,485,613 (Engelstad). The "et al." suffix is omitted in a reference name.

The applicants respectfully **disagree** but, solely in the interest of speeding the passage of this application to allowance, have hereby made clarifying amendments to claim 1 that more specifically set out the scope of the claim and differentiate from the prior art on record.

According to embodiments of the present invention, garbage collection is implemented in a limited resource environment (e.g., a smart card). Embodiments of the present invention include a garbage collection method where objects to be deleted are listed during a mark phase, and the objects are deleted during a sweep phase. To compensate for limited resources, the sweep phase is allocated according to a residual time of a communication cycle. The residual time may not be sufficient to completely delete the listed objects, and according to embodiments of the present invention, the sweep phase may be implemented over multiple communication cycles to prevent decrease in a quality of service that would occur if a user felt a response delay to an external command.

According to embodiments of the present invention, since the garbage collection process may be implemented over multiple communication cycles, a list of objects is an address list of objects stored in memory. In order to exclude the possibility of losing the list of objects to be deleted examined in the mark phase when the garbage collection is performed over a plurality of communication cycles and examiner the list again, the list of objects to be deleted is stored in memory, for example an EEPROM (specification page 9, lines 1-6).

That is, according to embodiments of the present invention, to ensure that the list

of objects to deleted is safely maintained for subsequent use throughout a plurality of communication cycles, the list including addresses of objects to be deleted is stored in memory. Since the list including the addresses of the objects to be deleted is separately stored from the objects, the list is not accidentally deleted during a sweep phase.

To better clarify these features of the present invention, the applicants have amended claim 1 to recite, inter alia, --storing the updated first list in the memory separately from the objects so as to prevent deletion of the first list--, support is found at least in the specification page 9, lines 1-6; thus no new matter has been added. As noted above, since the first list is stored separately from the objects, the first list is not accidentally deleted during a sweep phase.

The applicants respectfully submit that Hasbun and Engelstad, whether considered alone or in combination, fail to teach or even suggest the above features of the presently claimed invention. As previously presented in detail, neither Hasbun nor Englestad disclose or even suggest forming and maintaining a list, the list --being an address list including addresses of objects to be deleted from the memory--.

In the office action (page 6), the examiner alleges that Engelstad discloses performing a mark phase for marking a first list of objects to be deleted from memory because Engelstad discloses both marked and unmarked objects in a condemned region, where the list is "inherently from" the memory space. In the office action (page 7), the examiner alleges that Engelstad also discloses deleting objects of the first list and updating the first list, where the examiner alleges that "the list is updated because the freed object is removed from the generation."

The applicants respectfully submit that Engelstad clearly teaches away from the claimed --first list being an address list including addresses of objects to be deleted--. That is, the examiner alleges that Engelstad teaches a "list" because each object of Engelstad is either marked or unmarked. However, the applicants respectfully submit that this very configuration prevents Engelstad from teaching a list, because **each object must be scanned** to determine whether an object is marked before an object can be deleted (Engelstad col. 27, lines 9-16).

In contrast, during the sweep phase of the present invention, objects having

addresses included on the first list are deleted according to the list. Therefore, according to embodiments of the present invention, only objects to be deleted are addressed because no object by object determination must be made during the sweep phase.

The applicants respectfully submit the following illustrative example. Consider a situation where 10 objects are stored, and two of the objects are to be deleted through a garbage collection process. According to embodiments of the present invention, a list including addresses of the objects to be deleted is referenced to quickly determine which objects must be deleted, and no reference of the other 8 objects is performed. In contrast, according to Engelstad, all ten of the objects would have to be referenced to determine whether the object was marked. At best, even when considering the "generations" of Engelstad, Engelstad still requires referencing a greater number of objects than the presently claimed invention, and therefore Engelstad cannot teach the features of the presently claimed invention of claim 1 as amended above.

Further, since the "mark" of Engelstad is stored within the header of the object, the examiner cannot maintain that Engelstad discloses or even suggests --storing the updated first list in the memory separately from the objects so as to prevent deletion of the first list-- because Engelstad requires deleting of the "list" each time an object is deleted, and because clearly the list is not stored separately from the objects.

The applicants respectfully submit that Hasbun fails to make up for the deficiencies identified above with regard to Engelstad. Accordingly, the applicants respectfully submit that Hasbun and Engelstad, whether considered alone or in combination, fail to teach or even suggest the features of claim 1 as amended above, at least because both Hasbun and Engelstad fail to even suggest the --storing the updated first list in the memory separately from the objects so as to prevent deletion of the first list-- as claimed above. As such, the applicants respectfully request withdrawal of the aforementioned rejection and earnestly solicit an indication of allowable subject matter with respect to claim 1.

With regard to claims 10 and 13, the applicants respectfully submit that these claims have been amended to include the features above, and therefore these claims should be allowable at least for the reasons above.

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In the office action (page 9), claim 5 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Hasbun and Engelstad in view of U.S. Patent No. 5,355,483 (Serlet).

In the office action (page 10), claim 7 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Hasbun and Engelstad, in view of U.S. Publication No. 2002/0055941 (Kolodner).

In the office action (page 11), claims 8, 9, 11 and 12 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hasbun and Engelstad, in view of U.S. Patent No. 5,740,395 (Wells).

With regard to claims 2-9 and 11-12, the applicants respectfully submit that these claims are considered to be allowable at least because they depend from one of claims 1 and 10, which are considered to be condition for allowance for the reasons above.

For the reasons set forth above, the applicants respectfully submit that claims 1-13 pending in this application, are in condition for allowance over the cited references. Accordingly, the applicants respectfully request reconsideration and withdrawal of the outstanding rejections and earnestly solicit an indication of allowable subject matter.

This amendment is considered to be responsive to all points raised in the office action. Should the examiner have any remaining questions or concerns, the examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,

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